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## Value of Sending Men to Mars Is Vastly Outweighed by Cost

*A former member of the Space Science Board, Dr. Lederberg continues to work with NASA on a number of space missions.*

ON OCT. 4, 1957, I was in Melbourne, Australia lecturing on molecular genetics under the Fulbright educational exchange program. The Antarctic lights, the aurora australis, were unusually bright that spring, but they did not obscure the first view of Sputnik I launched that day, and not readily visible in the Northern Hemisphere until some time later.

We all remember the shock wave after the event: Had the Russians really managed such a thing, the people whom we had stereotyped as a peasantry. All in all, Sputnik was a relatively inexpensive way for the USSR to insure the credibility of its own missile deterrent. This role of spaceflight demonstrations has undoubtedly loomed very large in the major policy decisions of both superpowers.

On Nov. 7, I arrived at Calcutta to visit for a few days with J.B.S. Haldane who had left England for what he called his self-exile (in fact retirement) from an "American colony." We had grave differences in political outlook, but shared a common enthusiasm and long-held interest in planetary exploration.

As it happened, this was the night of a lunar eclipse, an event of some local religious significance with parades in the streets.

HALDANE remarked that it was the 40th anniversary of the Bolshevik revolution. He rather expected that the

USSR would mark the event by planting a thermonuclear red star on the moon. (Lunar 1, in fact, probed near the moon by January, 1959). I shuddered to think that the exploration of space would merely be an extension of the arms race. However, a moral equivalent of war is surely to be preferred to the real thing.

My own concerns that the scientific values of the space program, and the protection of its habitats for life (including our own) would be subordinated to geopolitics, date to that conversation.

Now, we can look back upon the extraordinary accomplishments of July, 1969: the Apollo 11 astronauts' flawless round trip to the moon and the two Mariner flights past Mars.

American scientists deserve very little credit for these achievements of engineering technology. Most scientists have been rather hostile to the expenditures for the Apollo program, and with a few exceptions, have been diffident or mildly interested in Mariner. Both programs would have been quite successful as engineering demonstrations with a minimum of support from academic scientists—whose requirements, if anything, may have complicated the engineering task.

AS A SCIENTIST, I salute the skill and dedication that went into these programs. I am also grateful for the opportunity to make some use of that technology for important scientific purposes. However, no scientific group has ever given a high priority to space technology at the expense of basic science or of educational and domestic needs.

At a time of expanding budgets for overall science, there was little merit in purely negative criticism of space projects. Nowadays, I seethe with frustration when complaints about cut-backs for the National Science Foundation are met with the unthinking reply: "Aren't you satisfied with \$17 billion of federal R&D, 'when almost all of this has gone into projects that academic scientists have generally opposed."

PLANS ARE being laid now for such missions as sending men to Mars. For the time being, they must be opposed on purely scientific grounds: there is nothing that a man can do on board a Mars mission that is not vastly outweighed by the cost of sheltering and feeding him on route.

Once there, he would make it impossible not to contaminate the planet with his litter, and his return carries the risk of contaminating the earth with his baggage.

As already demonstrated on the Mariner missions, men on the ground have plenty of chances for human participation in last-minute changes in programming the spacecraft. For the cost of the Apollo program, NASA could have retrieved enough moondust by instruments to give every U.S. taxpayer his own one-gram sample of the moon.

NASA administrator Dr. T. O. Paine promised the visitors at Cape Kennedy that he would stop the Apollo launch if that would help solve the problem of poverty. Of course it would not.

The way that he could help is to demand that Congress support the critical examination of alternative uses of our technological skills before embarking on new multibillion dollar exercises